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10014563 BA

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Doc Code: Computer

pages of specification

and/or sequence listing

and/or table

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Doc Code: Artifact

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Artifact Type Code: S

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Artifact Type Code: U

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Stapled Set(s) Color Documents or B/W Photographs

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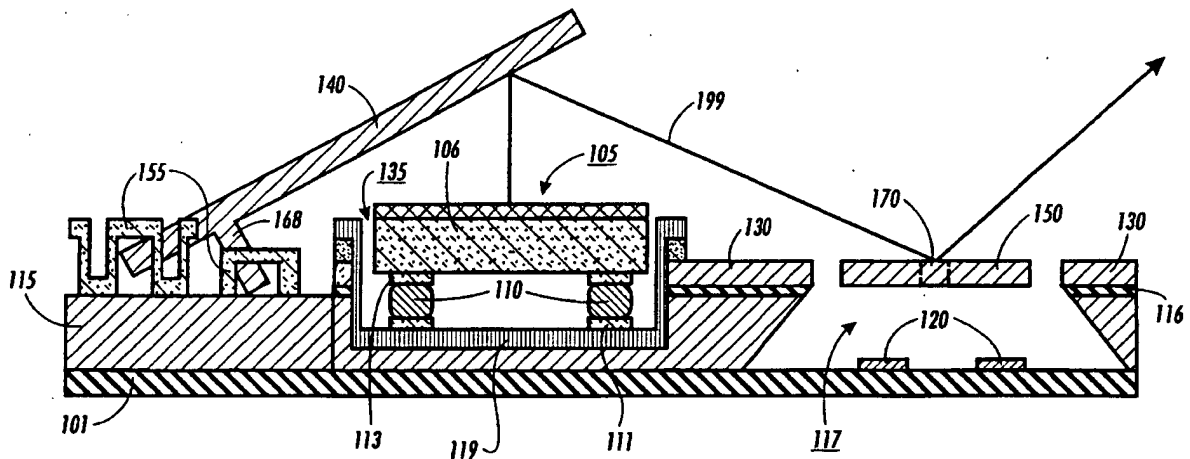
US006002507A

United States Patent [19]

Floyd et al.

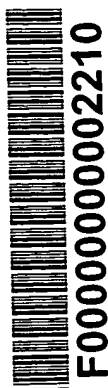
[11] **Patent Number:** 6,002,507[45] **Date of Patent:** Dec. 14, 1999[54] **METHOD AND APPARATUS FOR AN INTEGRATED LASER BEAM SCANNER**[75] **Inventors:** Philip D. Floyd; Decai Sun, both of Sunnyvale, Calif.; Joel A. Kubby, Rochester, N.Y.[73] **Assignee:** Xerox Corporation, Stamford, Conn.[21] **Appl. No.:** 09/201,738[22] **Filed:** Dec. 1, 1998[51] **Int. Cl.⁶** G02B 26/08[52] **U.S. Cl.** 359/201; 359/850; 359/224[58] **Field of Search** 359/198, 201, 359/202, 212, 213, 214, 220, 221, 223, 224, 225; 250/230, 234[56] **References Cited****U.S. PATENT DOCUMENTS**5,629,790 5/1997 Neukermans et al. 359/198
5,742,419 4/1998 Dickensheets 359/201**OTHER PUBLICATIONS**Daneman, M.J.; Solgaard, O.; Tien, N.C.; Lau, K.Y.; Muller, R.S. "Laser-to-Fiber Coupling Module Using a Micromachined Alignment Mirror." *IEEE Photonics Technology Letters*, vol. 8, No. 3, Mar. 1996, pp. 396-398.Judy, J.W.; Muller, R.S. "Batch-Fabricated, Addressable, Magnetically Actuated Microstructures." *Solid-State Sensor and Actuator Workshop*, Hilton Head, South Carolina, Jun. 2-6, 1996, pp. 187-190.Lin, L.Y.; Lee, S.S.; Pister, K.S.J.; Wu, M.C. "Self-aligned hybrid integration of semiconductor lasers with micromachined micro-optics for optoelectronic packaging." *Appl. Phys. Lett.* 66 (22), May 29, 1995. ©1995 American Institute of Physics, pp. 2946-2948.*Primary Examiner*—Cassandra Spyrou*Assistant Examiner*—Leo Boutsikaris[57] **ABSTRACT**

A solid state laser beam scanning system having a single crystal silicon deflection and scanning mirror integrated with a laser diode. By combining the techniques of deep reactive ion etching of silicon with solder bump bonding techniques, completed and tested laser diodes are integrated with silicon substrates supporting micro-electro-mechanical systems layers.

20 Claims, 11 Drawing Sheets

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6,002,507



The United States of America



The Commissioner of Patents and Trademarks

Has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

Therefore, this

United States Patent

Grants to the person(s) having title to this patent the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States of America or importing the invention into the United States of America for the term set forth below, subject to the payment of maintenance fees as provided by law.

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